

## The Star Cluster Population of M51

Mark Gieles<sup>1</sup>, Nate Bastian<sup>1,2</sup>, Henny Lamers<sup>1,3</sup>

<sup>1</sup> *Astronomical Institute, Utrecht University, Princetonplein 5, 3584 CC, Utrecht, The Netherlands*

<sup>2</sup> *European Southern Observatory, Karl-Schwarzschild-Strasse 2 D-85748 Garching b. München, Germany*

<sup>3</sup> *SRON Laboratory for Space Research, Utrecht, The Netherlands*

**Abstract.** We present the age and mass distribution of star clusters in M51. The structural parameters are found by fitting cluster evolution models to the spectral energy distribution consisting of 8 *HST-WFPC2* pass bands. There is evidence for a burst of cluster formation at the moment of the second encounter with the companion NGC5195 (50-100 Myr ago) and a hint for an earlier burst (400-500 Myr ago). The cluster IMF has a power law slope of -2.1. The disruption time of clusters is extremely short ( $< 100$  Myr for a  $10^4 M_{\odot}$  cluster).

### 1. Burst(s?) in the cluster formation rate

*N*-body models (Salo & Laurikainen 2000) suggest 2 interactions between M51 and the companion NGC5195. The age distribution shows clear evidence for a burst  $\sim 50$ -100 Myr ago and there is a hint for another burst at the epoch of the early encounter (see Fig. 1). The age distribution is complete for the last Gyr only for clusters with  $M_{cl} > 10^{4.7} M_{\odot}$  for which two bursts are clear. This makes it difficult to confirm the burst for all cluster masses.

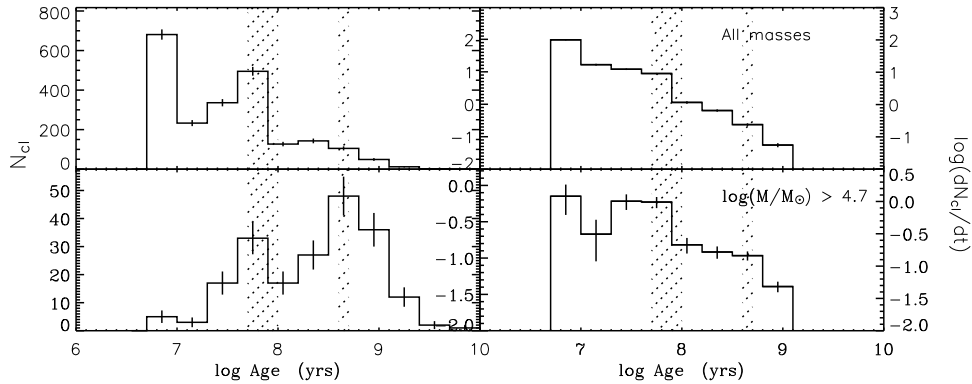


Figure 1. Age histogram in absolute numbers (left) and in number of clusters per Myr (right). The shaded regions are the predicted moments of encounter with NGC5195.

## 2. Disruption of clusters

Analytical models (Lamers 2004) predicting the age and mass distribution are fit to the data. The models assume: 1) a constant cluster formation rate with a burst between 50-100 Myr; 2) a CIMF with a slope of -2.1; 3) evolutionary fading under the detection limit and 4) a relation between the cluster disruption time and the cluster mass of the form:  $t_{\text{dis}} = t_4 (M_{\text{cl}}/10^4 M_{\odot})^{\gamma}$  (Boutloukos & Lamers 2003)

The value  $\gamma$  is found to be 0.6 from observations and  $N$ -body simulations (see Gieles et al., these proceedings). In Fig. 2 the best fit models for the age and mass histogram are shown for all clusters in M51 younger than 1 Gyr. The best fit value for  $t_4$  is  $4 \times 10^7$  yr. To see whether different cluster disruption times for different regions in M51 can be found, we divided M51 in rings with a diameter of 1 kpc. For each ring the disruption time  $t_4$  was determined. Values between  $2 \times 10^7$  yr and  $10^8$  yr were found, with no significant trend depending on the distance to the galactic center.

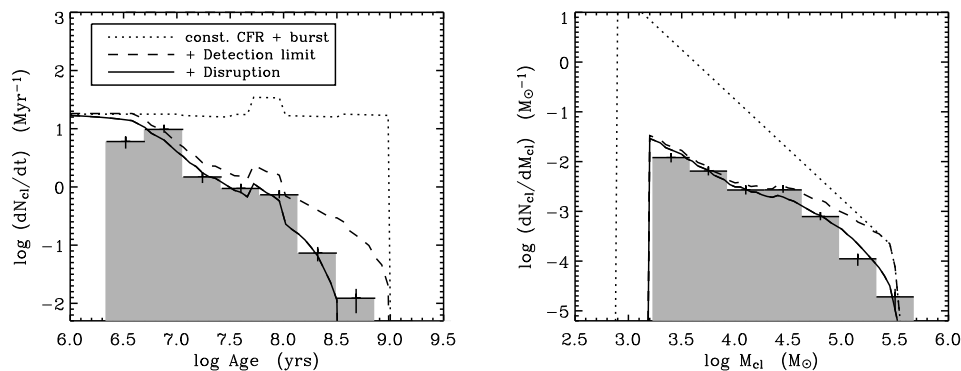


Figure 2. Best fit models for age and mass distribution. A  $t_4$  of  $4 \times 10^7$  Myr was needed to fit the observations. Left: number of clusters per Myr. Right: number of cluster per  $M_{\odot}$ .

## References

- Boutloukos, S. G. and Lamers, H. J. G. L. M., 2003, MNRAS 338, 717  
 Lamers, H. J. G. L. M., 2004, MNRAS, in prep  
 Salo, H., & Laurikainen, E. 2000, MNRAS, 319, 377